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PATENT & TRADEMARK OFFICE

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

Yuji SHIMOMURA, et al.

Docket No: Q78607

Appln. No.: 10/729,951

Group Art Unit: 3683

Confirmation No.: 2703

Examiner: Melody M. BURCH

Filed: December 9, 2003

For: ROLLING SLIDING MEMBER, PROCESS FOR THE PRODUCTION THEREOF AND ROLLING SLIDING UNIT

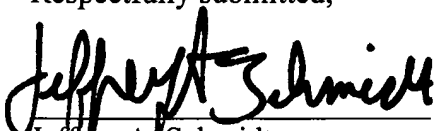
SUBMISSION OF APPEAL BRIEF

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith please find an Appeal Brief. A check for the statutory fee of $500.00 is attached. The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account. A duplicate copy of this paper is attached.

Respectfully submitted,



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WASHINGTON OFFICE
23373
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APPEAL BRIEF UNDER 37 C.F.R. § 41.37

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 41.37, Appellant submits the following:

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I. REAL PARTY IN INTEREST

The real party in interest is the Assignee, NSK Ltd., a company of Japan, by virtue of an assignment recorded on March 16, 2001 at reel 011618, frame 0649, in parent application 09/809,247.

II. RELATED APPEALS AND INTERFERENCES

There are no prior or pending appeals, judicial proceedings or interferences known to the appellant which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-12 are pending, have been rejected, and are the subject of this appeal.

Claims 13-17 have been canceled without prejudice or disclaimer, and are not the subject of this appeal.

IV. STATUS OF AMENDMENTS

On May 8, 2006, after the Final Office Action as mailed on February 6, 2006, Appellants filed a Response Under 37 C.F.R. § 1.116. However, no amendments were made to the claims. Accordingly, the claims stand as presented before the February 6 Final Office Action.

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V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention relates to improvements in surface conditions of a rolling sliding member which comes in rolling or sliding contact with its mating face during use such as a bearing ring (inner or outer ring) and rolling element constituting a rolling bearing or cam follower. More particularly, the present invention can exert a great effect particularly when used in an application which is subject to great load—and hence smearing or seizing—such as in a roll neck bearing.[1]

For the purpose of preventing rust or improving lubricating properties in the initial stage of operation, it is commonly practiced to provide a formed film of manganese phosphate on the surface of various mechanical parts made of an iron-based metal which makes displacement relative to the surface of its mating member during use, i.e., sliding surface thereof. However, formation not only causes a rise in surface roughness, but also worsens the dimensional accuracy by the thickness of the formed film. The rise in surface roughness and the deterioration of dimensional accuracy cause not only the rise in torque or calorific value in the initial stage of operation, but also the deterioration of rotary properties.[2]

In accordance with the conventional treatment involving mere film formation, the substrate metal covered by a formed film has a rough surface having a high surface roughness. This is because the surface of the substrate metal is eluted with a solvent during the process of production of the formed film. When this rough surface is exposed with the peeling of the formed film, the effect of preventing rust is lost. Further, the rough surface makes drastic metal contact with its mating surface, causing drastic abrasion that results in damage, such as smearing and seizing.[3]

[1] Specification at page 1, lines 7-14. See, also, page 4, lines 3-5.

[2] Specification at page 1, line 15 - page 2, line 1.

[3] Specification at page 7, lines 9-22.

It is thus an object of the present invention to provide a rolling sliding member which has a sufficient durability capable of enduring severe conditions, as in a roll neck, during use.[4] In a bearing for a roll neck, according to the present invention, selected surface roughness is so small that minute protrusions present thereon are small, whereby drastic abrasion can be inhibited, making it possible to prevent early peeling of formed film.[5] Further, even if a formed film is peeled, the process reaching peeling forms a mild phenomenon, i.e., the peeling is gradual over an extended period of time. Accordingly, the substrate which is an iron-based metal undergoes a so-called concordance. In other words, the surface roughness of the substrate is lessened before the foregoing formed film is peeled. Therefore, even after the peeling of the formed film, the substrate has sufficient abrasion resistance and seizing resistance.[6]

In order to achieve the above and other objects, there is provided according to claim 1, a rolling bearing for a roll neck, comprising (with exemplary reference to Figs. 9 and 10):

an inner ring 5 having an inner ring race 6 at its outer peripheral surface;

an outer ring 7a, b having an outer ring race 8 at its inner peripheral surface; and

a taper roller 9 disposed between said inner ring race 6 and said outer ring race 8, and having a rolling surface that is brought in contact with the inner and outer ring races 6, 8;

wherein at least a first one of the inner ring race 6, the outer ring race 8, and the rolling surface (on taper roller 9), comprises a first portion with a formed film made of a manganese phosphate, and

wherein at least a second one of the inner ring race, the outer ring race and the rolling surface comprises a second portion on which there is disposed no formed film but which has a surface roughness of 0.1 μm or less but greater than 0 μm in terms of Ra, and further wherein said second portion comes into contact with said first portion. See the specification at: page 9,

[4] Specification at page 8, lines 1-5.

[5] Specification at page 10, lines 1-11.

[6] Specification at page 10, lines 12-20.

lines 2-24; page 12, lines 3-30; page 28, line 3 - page 32, line 12; page 34, line 15 - page 35, line 10; page 36, lines 3-14; page 37, line 10 - page 40, line 5; page 40, line 25 - page 41, line 14; and page 42, lines 7-18.

Another embodiment for achieving the above and other objects is set forth in claim 6, wherein there is provided a rolling bearing for a roll neck, comprising (again with exemplary reference to Figs. 9 and 10):

an inner ring 5 having an inner ring race 6 at its outer peripheral surface;

an outer ring 7a, b having an outer ring race 8 at its inner peripheral surface; and

a taper roller 9 disposed between said inner ring race 6 and said outer ring race 8, and having a rolling surface that is brought in contact with the inner and outer ring races 6, 8;

wherein at least one of the inner ring race 6, the outer ring race 8, and the rolling surface (on taper roller 9), comprises a first portion which is comprising a smoothed formed film made of a manganese phosphate, (see the specification at: page 8, lines 13-23; page 9, lines 15-24; 13, lines 3-17; page 15, line 14 - page 20, line 13; page 22, lines 9-20; page 23, line 13 - page 24, line 10; page 24, line 20 - page 25, line 4; page 25, line 17 - page 32, line 7; and page 35, line 11 - page 36, line 2) and

wherein at least a second one of the inner ring race, the outer ring race, and the rolling surface, comprises a second portion on which there is disposed either a formed film, or no formed film but a surface roughness of 0.1 μm or less but greater than 0 μm in terms of Ra, and further wherein said second portion comes into contact with said first portion. With respect to no formed film but a surface roughness of 0.1 μm or less but greater than 0 μm in terms of Ra, see the same element as set forth in claim 1. With regard to a formed film, see the specification at: page 22, line 21 - page 23, line 12; page 24, lines 11-19; page 32, lines 13-18; page 33, line 21 - page 34, line 14; page 36, lines 14-24; and page 37, line 19 - page 40, line 24.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Ground 1 The Examiner rejected claims 1-12 under §103(a) as being unpatentable over US Patent 5,860,747 to Wan et al. in view of US Patent 5,630,668 to Ikezawa et al.

VII. ARGUMENT

Ground 1 The Examiner rejected claims 1-12 under §103(a) as being unpatentable over US Patent 5,860,747 to Wan et al. (hereinafter Wan) in view of US Patent 5,630,668 to Ikezawa et al. (hereinafter Ikezawa). Appellants respectfully traverse this rejection because the references fail to teach or suggest all of the elements as set forth and arranged in the claims, and because the Examiner' interpretation of Wan is unreasonable.

First, the references fail to teach or suggest all of the elements as set forth and arranged in the claims, because the Examiner misinterprets the teachings of Wan. Yet to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art.[7] Further, all words in a claim must be considered in judging the patentability of that claim against the prior art.[8]

The Examiner has misunderstood Wan. Specifically, the Examiner cites to Wan col. 1, lines 23-29, as teaching a film made of manganese phosphate.[9] However, in column 1, line 24, Wan discloses "a manganese phosphate-coating in the cage pockets". Note that the cage pocket is not an inner ring, outer ring, or rolling element surface, as claimed. Instead, the cage pocket is more akin to a retainer, i.e., a non-load-bearing structure that maintains spaces between rolling elements.

Thus, Wan does not teach or suggest "at least a first one of the inner ring race, the outer ring race and the rolling surface, comprises a first portion with a formed film made of a manganese phosphate" as set forth in clam 1. Similarly, Wan fails to teach or suggest "at least one of the inner ring race, the outer ring race, and the rolling surface, comprises a first portion which is comprising a smoothed formed film made of a manganese phosphate", as set forth in claim 6.

[7] *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

[8] *In re Wilson*, 424 F.2d 1382, 165 USPQ 494, 496 (CCPA 1970).

[9] August 17, 2005 Office Action at page 2, item 2, paragraph 2, lines 5-10.

Ikezawa does not cure the above-noted deficiencies in Wan. By way of further explanation, although Ikezawa discloses an embodiment using a manganese phosphate film in column 12, lines 27-28, this embodiment is explained as an alternative to an embodiment in which surface roughness is reduced (see column 11, lines 62-63). That is, in Ikezawa, when the manganese phosphate is applied, an embodiment to reduce the surface roughness is not applied. In other words, Ikezawa disclose using the manganese phosphate film separately from using a surface of which surface roughness is low. Accordingly, one of ordinary skill in the art following the teachings of Ikezawa would not have been motivated to use both a manganese phosphate film and a reduced surface roughness, as claimed.

The Examiner asserts that the addition of nitrogen reduces surface roughness.[10] However, the Examiner's assertion is not entirely correct. That is, Ikezawa sets forth nitrogen concentration in the surface as promoting corrosion resistance. See, for example, Ikezawa at: col. 2, lines 40-42 (second object is corrosion resistance); col. 2, lines 53-58 (second object obtained by nitrogen contained in the surface); col. 3, lines 8-16 (nitrogen contained in the surface prevents pitting even when the bearing is used in corrosive environment), see also col. 6, lines 52-60; col. 8, lines 27-41 (samples 1-3 had no surface treatment so surface roughness was not good, but had surface nitrogen concentration high enough that pitting and flaking did not occur—i.e., surface roughness is separate consideration from nitrogen concentration); col. 10, lines 59-65 (surface roughness is acceptable, but nitrogen concentration is low—i.e., again, surface roughness is a separate consideration from nitrogen concentration).

Accordingly, even assuming that one of ordinary skill in the art were motivated to combine the references as suggested by the Examiner, any such combination would still not teach or suggest a manganese phosphate film as set forth and arranged in the claims. Therefore, each one of claims 1 and 6 has unobviousness over Wan in view of Ikezawa. Likewise, dependent claims 2-5 and 7-12 are not rendered obvious by Wan and Ikezawa.

[10] Advisory Action at "Continuation of 11", lines 3-5.

Second, the Examiner's interpretation of Wan is unreasonable. Specifically, the Examiner asserts that the inner and outer races of the bearing are part of the cage pocket.[11] However, this is a distorted interpretation of a cage pocket, and is completely contradictory to the manner in which a cage pocket would be understood by one of ordinary skill in the art.

Instead, the term "cage" means a retainer which retains rolling elements, and does not include inner or outer race as asserted by the Examiner. Typically, at least a portion of the cage is disposed between the inner and outer rings of the bearing, and holds the rolling elements in a spaced relation along the raceways; the cage is a non-load-bearing member. This definition of a cage is consistent with that set forth in US Patent 5,669,719 to Kino (made of record in an IDS filed on December 9, 2003). As shown in Fig. 1-4, Kino discloses that the cage 9a includes cage pockets 10a, wherein these elements (cage and pockets) are separate from the inner race 5a and outer race 7a. And it is the inner race 5a and outer race 7a that respectively include the inner raceway 4a and outer raceway 6a contacting the rolling elements 14 under load. Furthermore in Wan itself, column 5, lines 50-55, he explains that reference 7 in Fig. 6 denotes cage, and references 11 and 13 denote parts of a cage pocket. Separately, Wan describes the inner our outer race as denoted by references 5 and 7 respectively. That is, the inner our outer races **are not** described as part of the cage pocket, nor would they be understood to be by one of ordinary skill in the art.

Thus, Wan does not teach or suggest "at least a first one of the inner ring race, the outer ring race and the rolling surface, comprises a first portion with a formed film made of a manganese phosphate" as set forth in clam 1. Instead, Wan's film is disposed on the cage pocket of the retainer ring. Similarly, Wan fails to teach or suggest "at least one of the inner ring race, the outer ring race, and the rolling surface, comprises a first portion which is comprising a smoothed formed film made of a manganese phosphate", as set forth in claim 6. Again, Wan's

[11] February 6, 2006 Office Action at page 3, item 3, 2nd paragraph.

film is disposed on the cage pocket, which does not include the inner and outer raceways. And Ikezawa does not cure these deficiencies in Wan.

Moreover, in fact, Wan actually teaches away from the use of a manganese phosphate film. Yet it is improper to combine references where the references teach away from their combination.[12] Specifically, Wan describes that such a manganese phosphate coating is "**not** satisfactory for several reasons."[13] Instead, Wan's invention resides in the use of a disulphide or diselenide of a Group V or VII transition metal instead of a manganese phosphate film.[14] Although Group V includes manganese, a diselenide or disulphide is not the same as a phosphate.

Accordingly, the references fail to teach or suggest a manganese phosphate film as set forth and arranged in the claims. Therefore, each one of claims 1 and 6 has unobviousness over Wan in view of Ikezawa. Likewise, dependent claims 2-5 and 7-12 are not rendered obvious by Wan and Ikezawa.

Conclusion

Unless a check is submitted herewith for the fee required under 37 C.F.R. §41.37(a) and 1.17(c), please charge said fee to Deposit Account No. 19-4880.

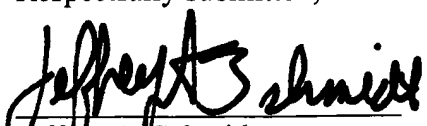
[12] *In re Grasselli*, 713 F.2d 731, 218 USPQ 769, 779 (Fed. Cir. 1983).

[13] Wan at col. 1, lines 23-41 (emphasis added).

[14] Wan at col. 1, lines 59-67.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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CLAIMS APPENDIX

Claims 1-12 on appeal:

1. A rolling bearing for a roll neck, comprising:

an inner ring having an inner ring race at its outer peripheral surface;

an outer ring having an outer ring race at its inner peripheral surface; and

a taper roller disposed between said inner ring race and said outer ring race, and having a rolling surface that is brought in contact with the inner and outer ring races;

wherein at least a first one of the inner ring race, the outer ring race, and the rolling surface, comprises a first portion with a formed film made of a manganese phosphate, and

wherein at least a second one of the inner ring race, the outer ring race and the rolling surface comprises a second portion on which there is disposed no formed film but which has a surface roughness of 0.1 μm or less but greater than 0 μm in terms of Ra, and further wherein said second portion comes into contact with said first portion.

2. A rolling bearing according to claim 1, wherein said formed film on said first portion has a surface roughness of 0.3 μm or less but greater than 0 μm in terms of Ra.

3. A rolling bearing according to claim 2, wherein said second portion comprises a surface roughness of 0.07 μm or less but greater than 0 μm in terms of Ra.

4. A rolling bearing according to claim 1, wherein said formed film on said first portion has a surface roughness of 0.6 μm or less but greater than 0 μm in terms of Ra.

5. A rolling bearing according to claim 4, wherein said second portion comprises a surface roughness of 0.05 μm or less but greater than 0 μm in terms of Ra.

6. A rolling bearing for a roll neck, comprising:

an inner ring having an inner ring race at its outer peripheral surface;

an outer ring having an outer ring race at its inner peripheral surface; and

a taper roller disposed between said inner ring race and said outer ring race, and having a rolling surface that is brought in contact with the inner and outer ring races;

wherein at least one of the inner ring race, the outer ring race, and the rolling surface, comprises a first portion which is comprising a smoothed formed film made of a manganese phosphate, and

wherein at least a second one of the inner ring race, the outer ring race, and the rolling surface, comprises a second portion on which there is disposed either a formed film, or no formed film but a surface roughness of 0.1 μm or less but greater than 0 μm in terms of Ra, and further wherein said second portion comes into contact with said first portion.

7. A rolling bearing according to claim 6, wherein said first portion comprises a surface roughness of 0.3 μm or less but greater than 0 μm in terms of Ra.

8. A rolling bearing according to claim 6, wherein said second portion comprises no formed film but comprises a surface roughness of 0.07 μm or less but greater than 0 μm in terms of Ra.

9. A rolling bearing according to claim 6, wherein said second portion comprises no formed film but comprises a surface roughness of 0.05 μm or less but greater than 0 μm in terms of Ra.

10. A rolling bearing according to claim 6, wherein said second portion comprises a formed film of manganese phosphate having a surface roughness of 1.2 μm or less but greater than 0 μm in terms of Ra.

11. A rolling bearing according to claim 6, wherein said second portion comprises a formed film of manganese phosphate having a surface roughness of 0.6 μm or less but greater than 0 μm in terms of Ra.

12. A rolling bearing according to claim 6, wherein said second portion comprises a formed film of manganese phosphate having a surface roughness of 0.3 μm or less but greater than 0 μm in terms of Ra.

EVIDENCE APPENDIX:

Pursuant to 37 C.F.R. § 41.37(c)(1)(ix), submitted herewith are copies of any evidence submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132 or any other evidence entered by the Examiner and relied upon by Appellant in the appeal.

Specifically, Appellants rely on the teachings of US Patent 5,669,719 to Kinno as showing that one of ordinary skill in the art would have understood the term "cage" as not including the inner ring, outer ring, the raceways thereon, or the rolling elements but, instead, a separate non-load-bearing structure that maintains spaces between rolling elements.

This document was submitted by Appellant in an IDS on December 9, 2003.

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RELATED PROCEEDINGS APPENDIX

NONE